

OPEN ACCESS

Volume: 7

Issue: 2

Month: March

Year: 2019

ISSN: 2320-2653

Received: 26.02.2019

Accepted: 06.03.2019

Published: 17.03.2019

Citation:

Rathnakumar, D.
"Enhancement of Learning
Science among Students
with Mild Intellectual
Disability Employing
Accessible Technology:
Feasible or a Challenge?"
*Shanlax International
Journal of Education*, vol. 7,
no. 2, 2019, pp. 9-14.

DOI:

[https://doi.org/10.34293/
education.v7i2.331](https://doi.org/10.34293/education.v7i2.331)



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Enhancement of Learning Science Among Students with Mild Intellectual Disability Employing Accessible Technology: Feasible or a Challenge?

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Abstract

Learning is a unique process for each learner, affected by many instructional and learning factors. Exploring the process of learning is an ongoing expedition, never-ending and challenging as well. It is learnt that no individual, particular strategy, method or approach is appropriate for helping intellectually disabled students in learning or achieving all competencies including Learning Science. Every disability, however mild or moderate, imposes on the individual certain functional limitations. Technology helps to mitigate such limitations thus promoting learning. An accessible assistive technology permits either no or minimal adaptation by students with disabilities in the use of technology in academic settings. The techniques of accessibility are based on recent technologies and design strategies to allow more flexible use of content and easier implementation of dynamic methods and models in instruction. Technology-oriented learning environment employing Accessible Technology ensures educational equity by providing access and equitable learning opportunity through personalized and differentiated instruction which can accommodate each learner's needs and preferences.

Keywords: Intellectual Disability, Technology, Competencies, Digital devices, CAI, CAIF.

Computer-Assisted Instruction (CAI)

Technology tools employed in the teaching-learning processes encompass a wide range of digital devices such as computers, tablets, iPads, multi-touch screens, interactive smart boards and mobile devices. Recent advances, especially in the area of instructional technology, have heralded the developments and the implementation of new and innovative individualized instructional strategies such as Computer-Assisted Instruction using iPad (touch screen).

Enhancement of Learning Science among Students with Mild Intellectual Disability Employing Accessible Technology.

Much research has been conducted on learning characteristics of individuals with mental retardation, science learning of such individuals has received far less attention, and the teachers were not skilled enough at adapting instruction to meet the special needs that arise out of the characteristics of these learners Scuggs and Mastropieri (1995). “Practising special and science educators are inadequately prepared to make appropriate instructional adjustments for students with disabilities” (McGinnis and Stefanic, 2007).

Meeting the expectations of science education is a substantial challenge for most students and their teachers. It is a larger challenge for students with intellectual disabilities who face difficulties in acquiring and retaining knowledge as well as demonstrating their competence. Understanding these disabilities and adjusting teaching practices and curriculum to accommodate the needs of the students is of particular importance when teaching science. Children with intellectual disability should have equal access to quality science education.

In the present study Learning Science refers to the achievement score (dependent variable) obtained in classified and structured learning of science concepts/units of Parts of the Plant, Living and Non living Things, Water, Natural Resources, Work-Push and Pull, and Solids, Liquids and Gases in Standard Two Text Book in Environmental science section followed in the state schools of Tamil Nadu.

CAI refers to the utilisation of computer technology to facilitate learning, such as tutorials, simulations, and drill-and-practice programmes. Research has shown that well-designed and implemented CAI can significantly improve student achievement including Learning Science (Najjar 2001). The possibility of designing instructional tools to meet the individual needs of students will make the computers potentially a powerful tool for learning. Computer-Assisted Science instruction programmes can demonstrate concepts, instruct, and remediate student errors in learning various science concepts. At the elementary level, Computer-Assisted Instructions can influence science learning as disclosed by Tekbiyik and Akdeniz (2010). For children with disabilities, technology can provide access to learning opportunities previously closed to them.

Accessible technology is referred to computer technology that enables learners with and without a disability to adjust a computer to meet their vision, hearing, dexterity, cognitive, speech, mobility, and learning needs. Accessible Technology uses adapted teaching-learning materials with embedded accommodations, and assistive technology, report (USDE, 2017).

Digital tools such as iPads allow to adapt the science content and level of its complexity according to the learner preferences and can learn at their own pace; bringing equity in their learning experiences. When educators appropriately integrate technology and interactive media into their classrooms, equity and access are addressed by providing opportunities for all children to participate and learn (Judge, Puckette, and Cabuk 2001; Cross, Woods, and Schweingruber 2009). Accessible Technology can enable children with intellectual disability to manage complex learning environment in Learning Science. Often, Computerized instructional materials are not available in formats that are accessible to students with intellectual disabilities. Hence, the pedagogy of technology adaption in the classroom is important.

Hence the need has arrived to know about the feasibility of accessible technology in Learning Science among students with intellectual disability. The present study aims at finding out the extent of the feasibility of Accessible Technology in Learning Science among students with Mild Intellectual Disability. If feasible, find out the level of students’ achievement in terms of content types in science.

Objectives

1. To develop a Computer-Assisted Instructional Programme using iPad on Learning Science among students with a mild intellectual disability at Lower Primary level.
2. To study the feasibility of Accessible Technology in terms of mean achievement score in Learning Science concepts obtained by the selected sample.
3. To compare the pretest and posttest performance of the selected sample in Learning Science concepts employing Computer-Assisted Instruction using iPad.

Hypothesis

There will be no significant difference in gain in achievement mean scores in Learning Science of the students with mild intellectual disability before and after treatment employing accessible technology for the science concepts: Parts of the Plant, Living and Non living Things, Water, Natural Resources, Work-Push and Pull, and Solids, Liquids and Gases.

Method

Research Design

Single Group Experimental Pre and Post Test design were followed in the study.

Sample

The sample of the present study consisted of 20 students with Mild Intellectual Disability (age range of 8 to 11 years) of Standard Two in a special school at Tiruchirapalli. The sample was selected by pre-intervention assessment of student's literacy performance (using the Behavioural Assessment Scale for Indian Children with Mental Retardation (BASIC-MR) Part-A for skill behaviour). No prompt or corrective feedback was given. Reinforcers were identified by interviewing teachers and observing students. The researcher screened for the following pre-requisites skills such as visual ability to see pictures and words displayed on the iPad, the ability to hear directions; the ability to operate the iPad independently by touching the screen with index finger; the ability to attend to a teacher-directed task for at least 10 minutes.

Tools

The investigator employed the following tools for data collection in the present study:

- BASIC-MR (Part A) adapted and validated.
- Computer-Assisted Instructional Package using iPad (on the content for instruction) – validated.
- Achievement Test in Science (criterion-referenced) developed and Content validity was established for the tool.

Research Procedure

Computer-Assisted Instructional Framework (CAIF) and Programme for the Science Learning of Mild Intellectually Disabled students using iPad (touch screen) was developed to provide intervention to the sample. The developed CAI programme for Learning Science was transacted to the selected sample.

A science achievement test was designed, developed and used by the researcher as a measuring instrument both in Pre-test and Post-test. The measurement instrument for children with mild mental retardation from dependence to independence. It was constructed by the researcher for the classified six concepts/ units. Every unit consists of 5 categories of graded tasks of Matching, Choosing, Identification, Writing and Colouring (for generalization) with increasing difficulty were identified. The Achievement test having twenty-five items in each concept/ unit were formulated related to the identified and classified science concepts/units. The achievement test is a normal conventional type of paper-pencil test of question-cum-answer sheet pattern. The reliability and validity for the developed CAI package and the questionnaire were established appropriately. The developed CAI package using iPad was administered to the selected sample of twenty students for 30 sessions which spread over six weeks (1 hour per day for five days per week). After six weeks of intervention the same questionnaire used for pretest was administered (posttest) and scores were obtained. The collected data were analysed both quantitatively and qualitatively; the Null hypothesis was tested using 't'-test.

Results and Discussion

Achievement scores were obtained by conducting an achievement test after providing Computer-Assisted instruction using an iPad to the experimental group. The following table and graph furnish the data of the Post-test (achievement test) performance of the experimental group; it also furnishes the significance of the difference between the achievement scores of subjects in Learning Science.

Table 1: Mean Difference between the Pre-Test and Post-Test Scores of CAI using iPad on Learning Science Concepts- Units

Test	N	Mean	SD	t-value	Level of Significance
Parts of the Plant					
Pre-Test	20	70.00	8.12	5.38	P 0.01
Post-Test	20	79.85	7.81		
Living and Non Living Things					
Pre-Test	20	56.20	6.23	6.98	P 0.01
Post-Test	20	72.60	8.40		
Water					
Pre-Test	20	49.00	5.81	7.94	P 0.01
Post-Test	20	66.15	7.49		
Natural Resources					
Pre-Test	20	52.80	6.94	7.13	P 0.01
Post-Test	20	69.85	8.11		
Work-Push and Pull					
Pre-Test	20	57.00	6.32	6.35	P 0.01
Post-Test	20	72.25	8.67		
Solids, Liquids and Gases					
Pre-Test	20	30.00	5.29	13.27	P 0.01
Post-Test	20	57.20	7.48		

For testing the hypothesis, ‘t’ test’ was used. Based on the data analysis, it is inferred that there is a significant difference between the Mean Scores before and after treatment for the selected six science concepts namely Parts of the Plants, Living and Non living Things, Water, Natural Resources, Work-Push and Pull, and Solids, Liquids and Gases at 0.01 levels in Learning Science among students with Mild Intellectual disability. Hence the null hypothesis is not tenable in the report of all the six science

concepts in Learning Science among students with mild intellectual disability and is rejected. It may, therefore, be concluded that employing Computer-Assisted Instruction using iPad as accessible technology helps in enhancing the achievement of students with a mild intellectual disability on Learning Science. Employing Accessible Technology in Learning Science among students with a mild intellectual disability is feasible and not a challenge.

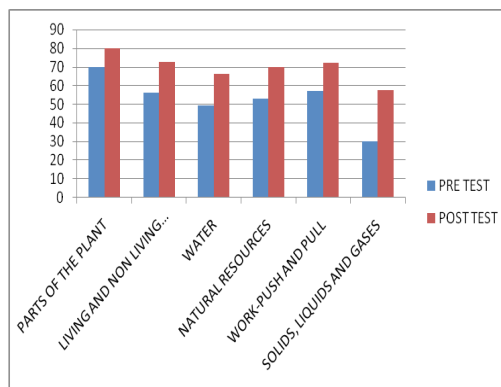


Figure: Difference between Achievement Mean Scores of Pre-Test and Post-Test of Experimental Group in Learning Science

It is understood from the study that when the student learns science was employing CAI using iPad their achievement is greater. The results of the present study align with reports of Scruggs and Mastropieri (2007) that different instructional interventions effectively employed and a variety of validated practices could promote all aspects of science learning of students with disabilities. Foshay and Ludlow (2005) in (Wehmeyer and Agran (2005), Stock, Davies, Davies and Wehmeyer (2006) recommended that the best option could very well be to use touch screen computers, which represent a valuable tool for individuals with intellectual disability. Accessibility features can help students with disabilities on an equal footing with their peers and focus their energies on learning, and engaging with high-quality content. Designing for accessibility can empower the student to succeed and improve their learning experience (Henry, S.L., and Arch, A., eds.2012). "With proper implementation and integration with effective teaching, mobile technology will be a non-stigmatizing, customizable, efficacious educational support for students with intellectual disabilities" reported (Cathi Draper Rodriguez; Iva Strandova and Therese M., Cumming, 2015).

Conclusion

It was deciphered that employing Accessible Technology on Learning Science among students with Mild Intellectual disability is feasible, not a challenge; the integration of technology, pedagogy and content knowledge utilizing Accessible Technology enable Learning of Science if it is appropriately designed and implemented. And if any of the design features are lacking or compromised, it poses a challenge in Learning Science and not feasible.

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